No Price Like Home

House Prices in Advanced Economies, 1870–2012

Katharina Knoll[⋆] Moritz Schularick[†] Thomas Steger[§]

Bank of Italy
December 3, 2015

[⋆]University of Bonn
[†]University of Bonn; CEPR and CESifo
[§]University of Leipzig, CESifo and IWH

Why do we care

There is no place and no price like home.

- Houses as the largest component of household wealth.
- Houses as key collateral for bank lending.
- Housing wealth is central for long-run trends in wealth-to-income ratios (Piketty and Zucman, 2014).

The questions

- How have house prices developed in the long-run?
- What has been driving the recent surge in house prices?

The approach

- **New dataset** that allows the systematic study of real house prices in 14 advanced economies between 1870 and 2012.
  - Since the 1870s: Australia, Belgium, Germany, Denmark, France, the Netherlands, Norway, Sweden.
  - Since the 1890s: UK, US .
  - Since the early 1900s: Finland, Japan, Switzerland.
  - Since the early 1920s: Canada.

- **Decomposing house prices** into its two main components: structure and land.

What we find

- **Real house prices exhibit a "hockey stick pattern"**: prices stayed constant until the mid-20th century and have risen strongly in the last decades of the 20th century.
- **Land prices are the key to understanding this pattern.** About 80 percent of the increase in real house prices in advanced economies in the second half of the 20th century can be explained by higher land values alone.

Where do the data come from

Main Sources

- National official statistical publications
- Published & unpublished data from tax authorities & real estate associations
- Previous work of financial historians & commercial data providers

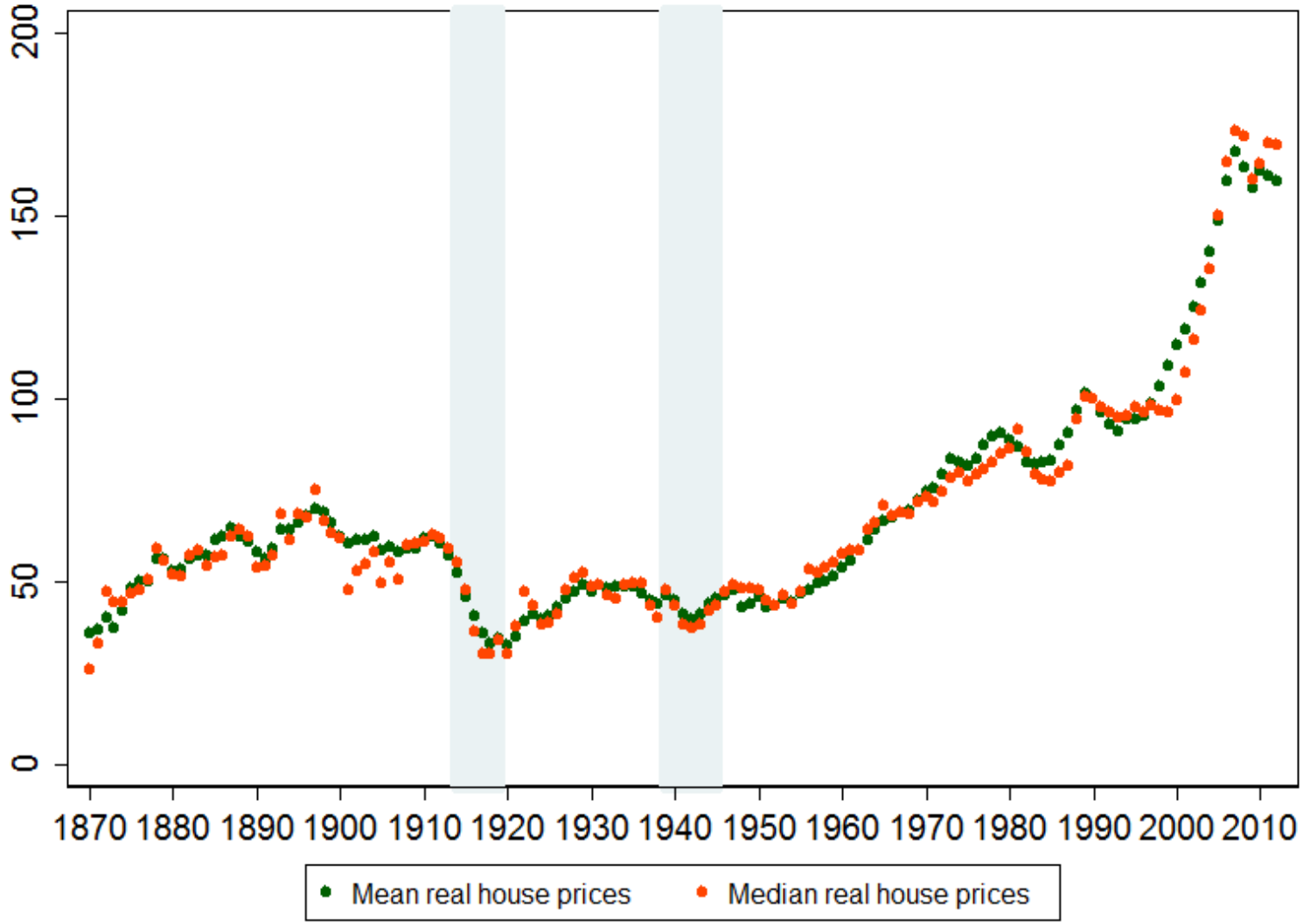
Challenges and coping strategies

- Constant quality
- Focus on within-country consistency
- Historical plausibility

▸ Indices Primer ▸ Indices Snapshot ▸ U.K. I ▸ U.K. II ▸ U.K. III ▸ DEU I ▸ DEU II ▸ DEU III

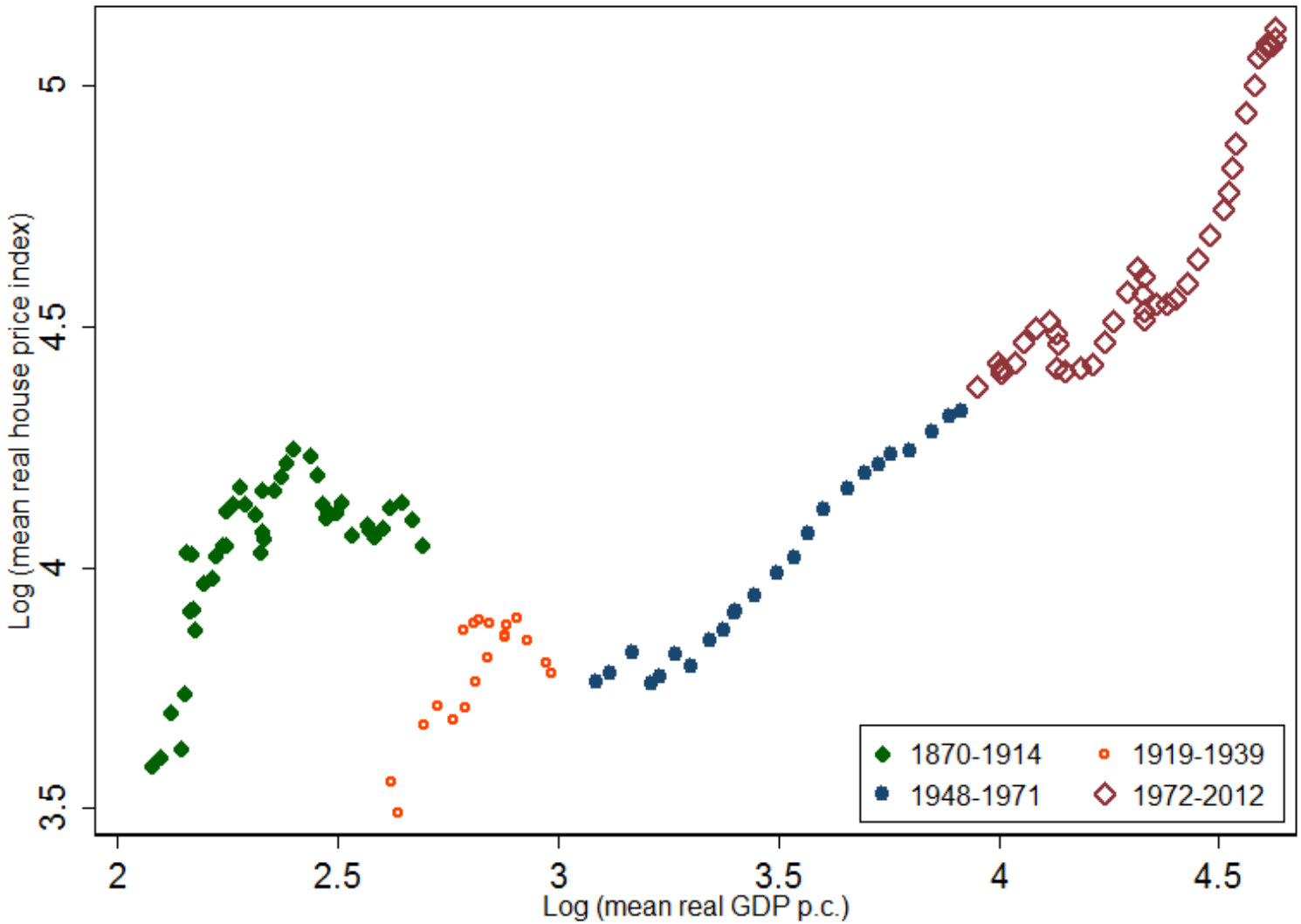
Global house prices

CPI deflated, index 1990=100



House prices and income

GDP per capita



Decomposing house prices I

- Housing sector (competitive) production function:

$$F(Z, X) = (Z_t)^{\alpha}(X_t)^{1-\alpha},\ \alpha \in (0, 1)$$

  - ◇ combining land Z and residential structures X

- Profit maximization yields:

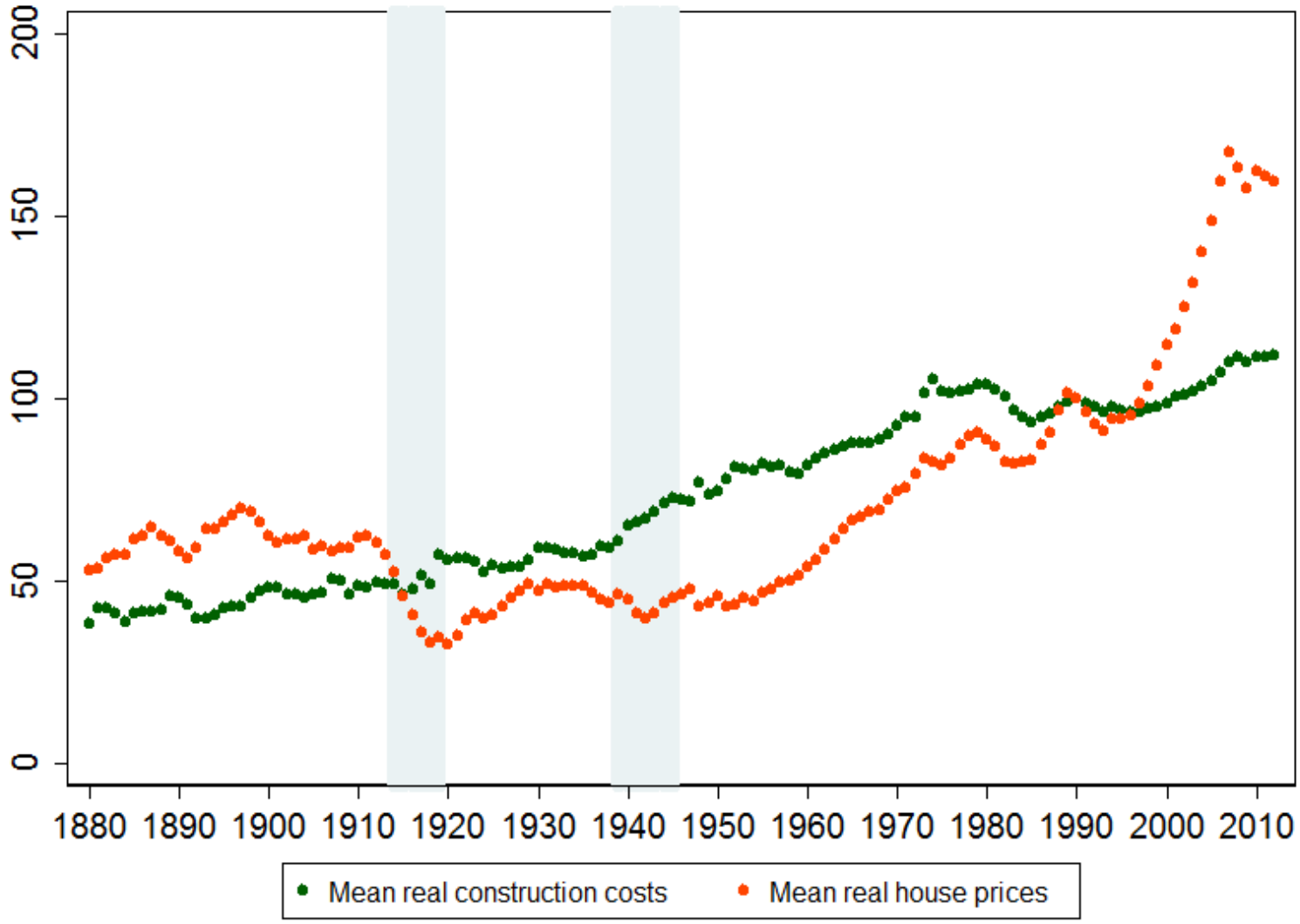
$$p_t^H = B(p_t^Z)^{\alpha}(p_t^X)^{1-\alpha}$$

  - ◇ with $B := (\alpha)^{-\alpha}(1-\alpha)^{-(1-\alpha)}$
  - ◇ house price depends on the price of land p_t^Z and the price of (quality-adjusted) residential structures p_t^X

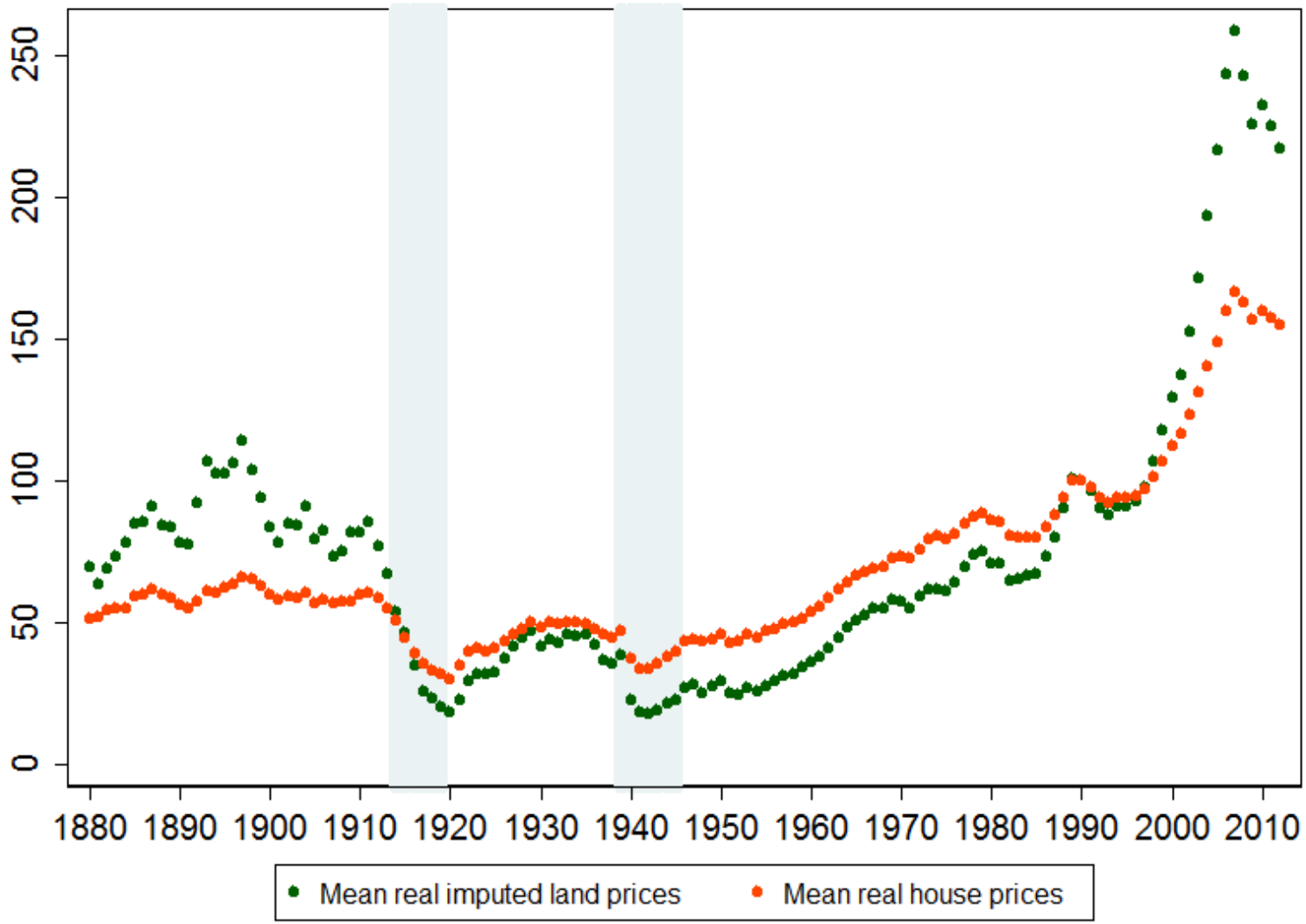
- Implied growth rate of imputed land price:

$$\frac{p_{t+1}^Z}{p_t^Z} = \left(\frac{p_{t+1}^H}{p_t^H}\right)^{\frac{1}{\alpha}} \left(\frac{p_{t+1}^X}{p_t^X}\right)^{\frac{\alpha-1}{\alpha}}$$

Decomposing house prices II: Construction costs



Decomposing house prices III: Imputed land prices



Accounting for the global house price boom I

Back to decomposition exercise: recall that growth in global house prices 1950–2012 can be expressed as

$$\underbrace{\frac{p^H_{2012}}{p^H_{1950}}}_{\textit{observed}} = \underbrace{\left(\frac{p^Z_{2012}}{p^Z_{1950}}\right)^{\alpha}}_{\textit{imputed}} \underbrace{\left(\frac{p^X_{2012}}{p^X_{1950}}\right)^{1-\alpha}}_{\textit{observed}}$$

- with $\frac{p^H_{2012}}{p^H_{1950}} = 3.4$ and $\frac{p^X_{2012}}{p^X_{1950}} = 1.6$, $\frac{p^Z_{2012}}{p^Z_{1950}} = 7.3$
- setting $\alpha = 0.5$

Accounting for the global house price boom II

Solving for the share of house price growth that can be attributed to land prices yields

$$\alpha \frac{ln\left(\frac{p^Z_{2012}}{p^Z_{1950}}\right)}{ln\left(\frac{p^H_{2012}}{p^H_{1950}}\right)} = 0.81$$

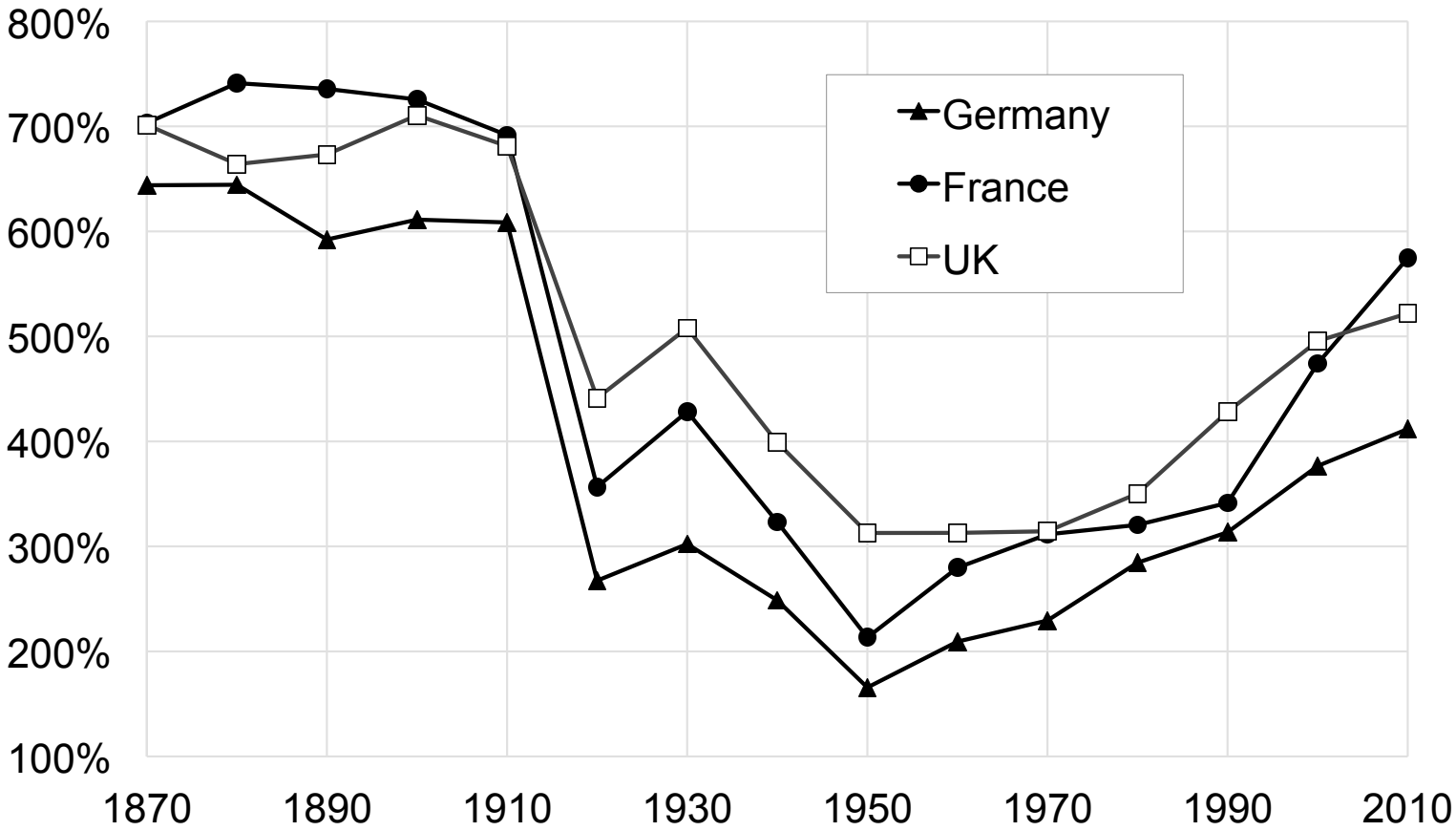
Share that can be attributed to land prices amounts to 81 percent on average

- upper bound: Finland, 96 percent
- lower bound: U.K., 74 percent

Suggests land price dynamics as main driver of house prices in the 2nd half of the 20th century.

Implications for wealth-to-income ratios I

Wealth-to-income ratios, 1870–2010



Source: Chartbook, Piketty and Zucman (2014).

Implications for wealth-to-income ratios II

Land share in housing wealth

	AUS	CAN	DEU	FRA	GBR	JPN	NLD	USA
1880			0.13	0.25				
1890						0.40		
1900	0.54		0.18			0.40		0.21
1913/1914	0.43		0.20	0.30		0.43		0.20
1920								0.20
1930	0.40		0.17	0.30	0.23	0.52		0.20
1940			0.17		0.19	0.46		0.20
1950	0.49		0.17	0.32	0.17	0.65	0.15	0.13
1960	0.40		0.17	0.30	0.12	0.85		0.13
1970		0.48	0.25	0.30	0.15	0.86		0.19
1980	0.40	0.52		0.41	0.11	0.81		0.27
1990	0.62	0.47	0.36	0.42		0.90		0.40
2000	0.63	0.49	0.32	0.39		0.81	0.57	0.36
2010	0.71	0.53	0.37	0.59	0.54	0.77	0.53	0.38

Note: Dates are approximate.

Implications for wealth-to-income ratios III

The price channel in wealth dynamics

- National wealth consists of components that are accumulable (K) and components that are fixed (Z): $W = K + p^Z Z$
- Quantity channel (Piketty, 2014) vs. price channel
  - if $\hat{p^Z} > g$, $\frac{W}{Y}$ max increase even if $\frac{K}{Y}$ remains constant
  - price channel may have played a critical role in recent wealth dynamics

Conclusion

- The international trend in real house prices since 1870 has followed a "hockey-stick-pattern".
- Land price appreciation plays a central role (as opposed to construction costs) in driving housing values.
- Land price dynamics are central for long-run trends in wealth-to-income ratios.

Appendix

A primer on house price indices

Key terms and choices

House price: Composite measure of price of land and price of structure with the structure being priced at its replacement costs (materials and wages).

Important choices for indices

- Type and vintage of houses
- Geographic coverage
- Type of price data (transaction prices, list prices, appraisals)
- Method of index construction (mean, stratification, hedonic, repeat sales)

Back

Table: Overview of house price indices.

Country	Years	Geographic Coverage	Property Vintage & Type	Method
Australia	1870–1899	Urban	Existing Dwellings	Median Price
	1900–2002	Urban	Existing Dwellings	Median Price
	2003–2012	Urban	New & Existing Dwellings	Mix-Adjustment
Belgium	1878–1950	Urban	Existing Dwellings	Median Price
	1951–1985	Nationwide	Existing Dwellings	Average Price
	1986–2012	Nationwide	Existing Dwellings	Mix-Adjustment
Canada	1921–1949	Nationwide	Existing Dwellings	Replacement Values (incl. Land)
	1956–1974	Nationwide	New & Existing Dwellings	Average Price
	1975–2012	Urban	Existing Dwellings	Average Price
Denmark	1875–1937	Rural	Existing Dwellings	Average Price
	1938–1970	Nationwide	Existing Dwellings	Average Price
	1971–2012	Nationwide	New & Existing Dwellings	SPAR
Finland	1905–1946	Urban	Land Only	Average Price
	1947–1969	Urban	Existing Dwellings	Average Price
	1970–2012	Nationwide	Existing Dwellings	Mix-Adjustment, Hedonic
France	1870–1935	Urban	Existing Dwellings	Repeat Sales
	1936–1995	Nationwide	Existing Dwellings	Repeat Sales
	1996–2012	Nationwide	Existing Dwellings	Mix-Adjustment
Germany	1870–1902	Urban	All Existing Real Estate	Average Price
	1903–1922	Urban	All Existing Real Estate	Average Price
	1923–1938	Urban	All Existing Real Estate	Average Price
	1962–1969	Nationwide	Land Only	Average Price
	1970–2012	Urban	New & Existing Dwellings	Mix-Adjustment

Back

Where do the data come from

Example: U.K.

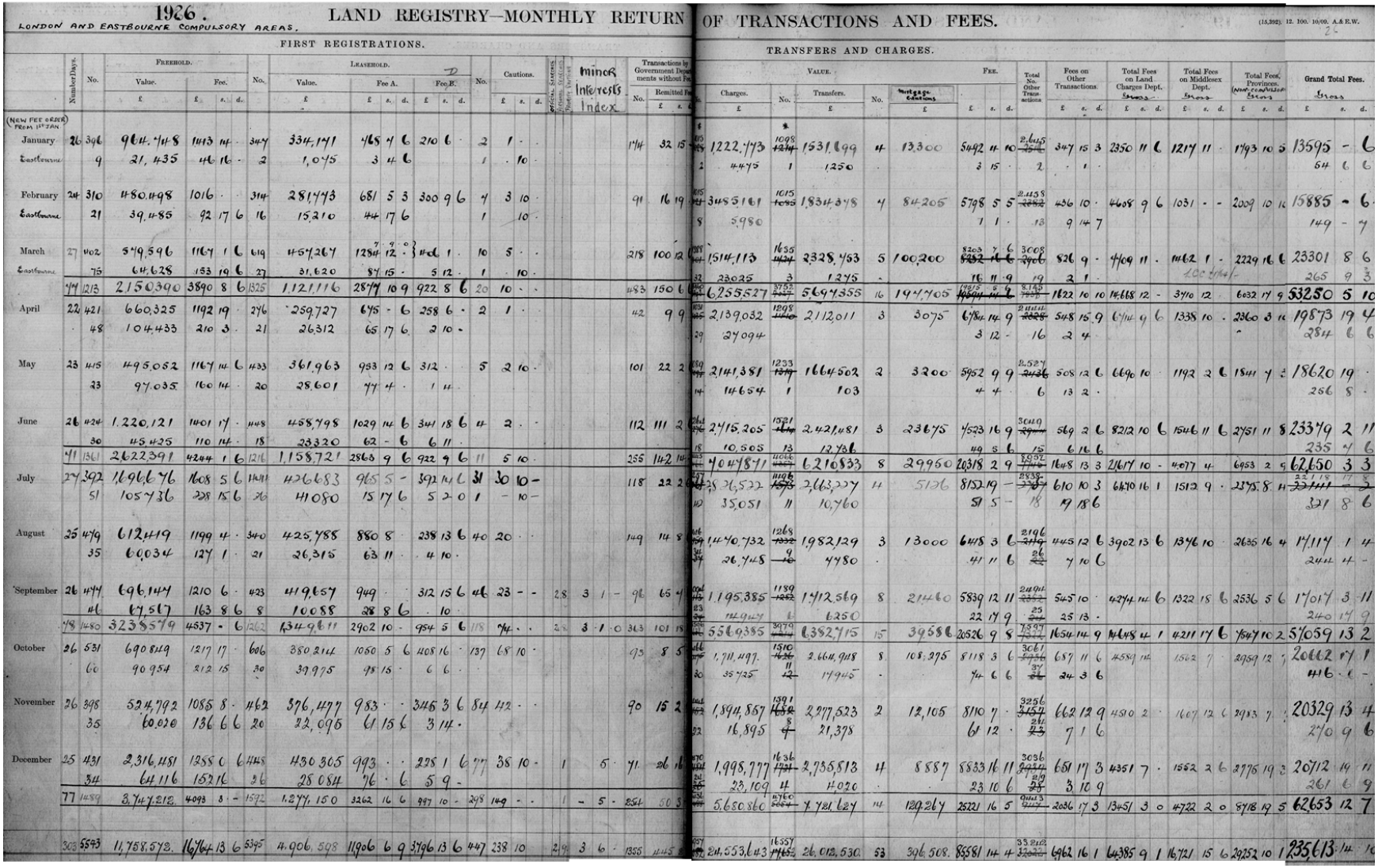
- 1899–1929: Unpublished records of the U.K. Land Registry
- 1930–1994: Data provided by the Department for Communities and Local Government using mainly information from surveys of mortgage lenders (BS4 survey, BSM survey)
- 1995–2012: U.K. Land Registry house price index

- Other data sources
  - Indices for shorter periods, e.g. Co-Operative Building Society and Halifax; Wilkinson and Sigsworth (1977); Holmans (2005)
  - Narrative evidence, e.g. "Land and Property" published annually in *The Economist* in the 1910s and 1920s

Back

Where do data come from

Example: U.K., 1899-1929 - Land Registry



1926.

LONDON AND EASTBOURNE COMPULSORY AREAS.

LAND REGISTRY—MONTHLY RETURN OF TRANSACTIONS AND FEES.

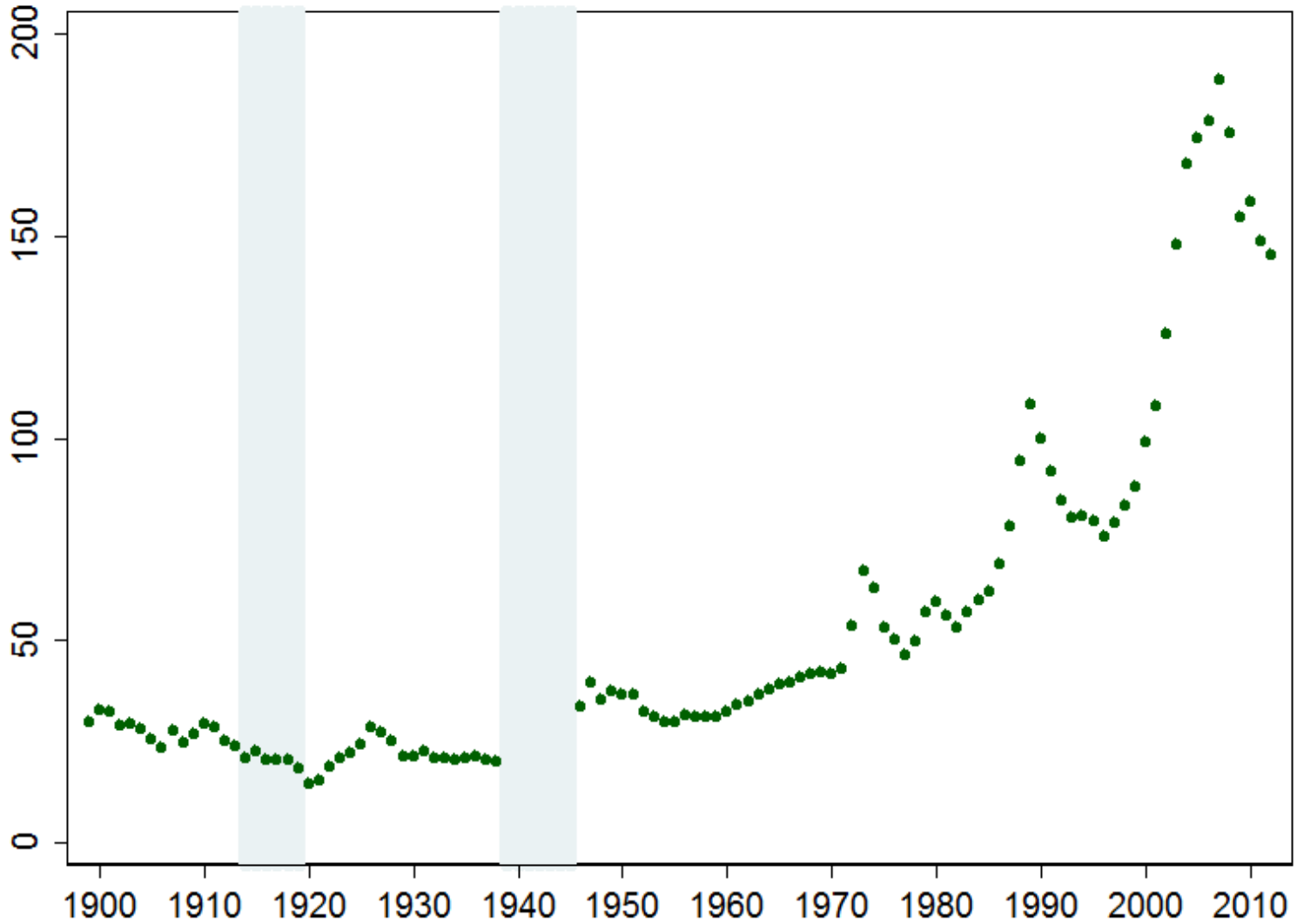
FIRST REGISTRATIONS.

TRANSFERS AND CHARGES.

Back

Country trends

Example: U.K., 1899–2012



▸ Example: Norway ▸ Back

Where do the data come from

Example: Germany

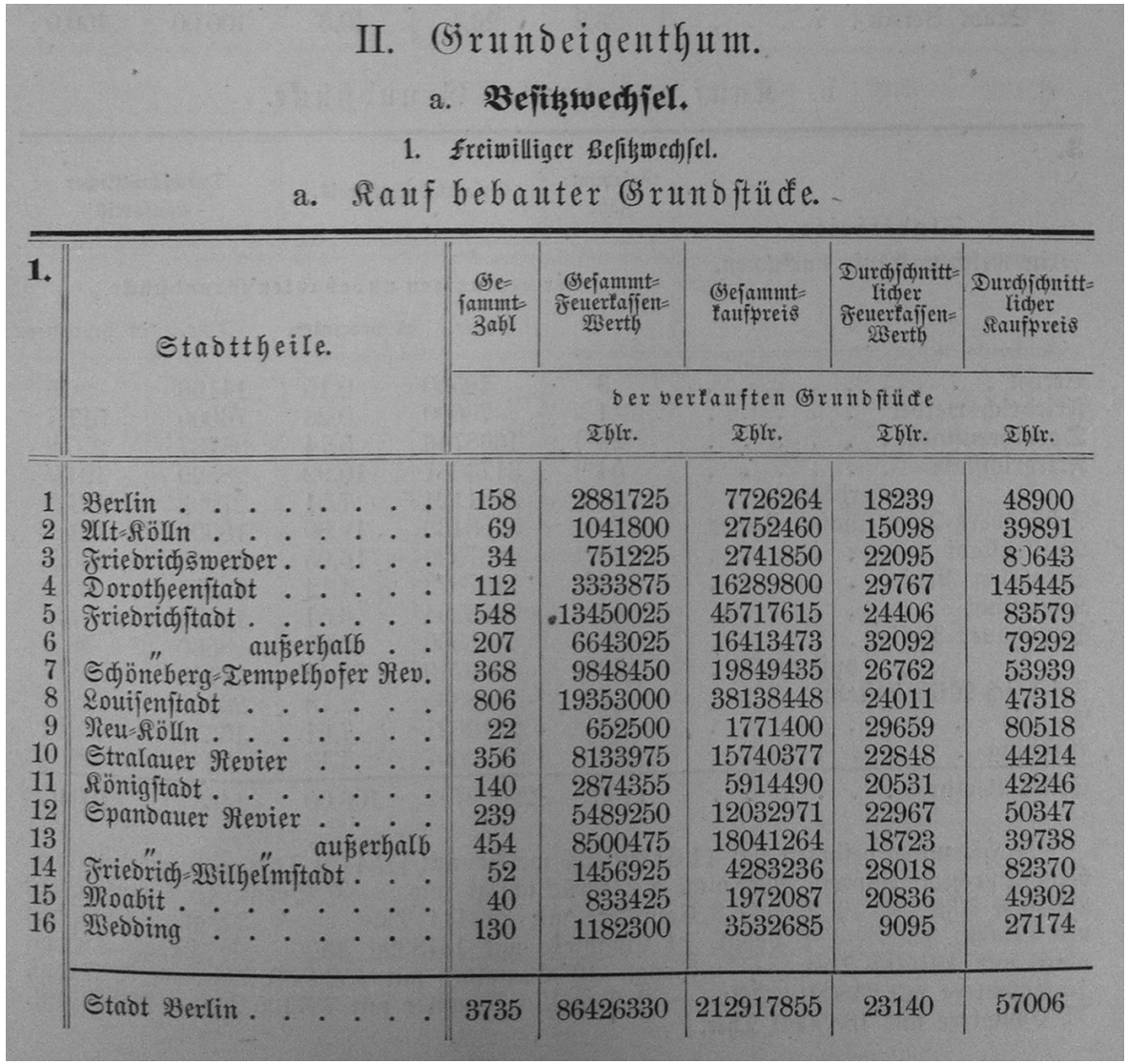
- 1870–1938: Statistical yearbooks of Berlin, Hamburg, German cities and municipalities
- 1938–1960: Deutsches Volksheimstättenwerk
- 1961–1970: Federal Statistical Office
- 1971–2012: BulwienGesa using data from data from different sources such as IVD – Immobilienverband Deutschland, municipalities (surveyor committees), building and loan associations

- Other data sources
  - Indices for shorter periods, e.g. Rothkegel (1920) for Mariendorf, Ensgraber (1913) for Darmstadt.
  - Narrative evidence, e.g. Carthaus (1917) for Dresden, Munich, Berlin, newspaper accounts such as DER SPIEGEL (1961), Koch (1961) in *DIE ZEIT*

Back

Where do the data come from

Example: Germany - Statistical Yearbook of Berlin, 1874



II. Grundeigenthum.

a. **Besitzwechsel.**

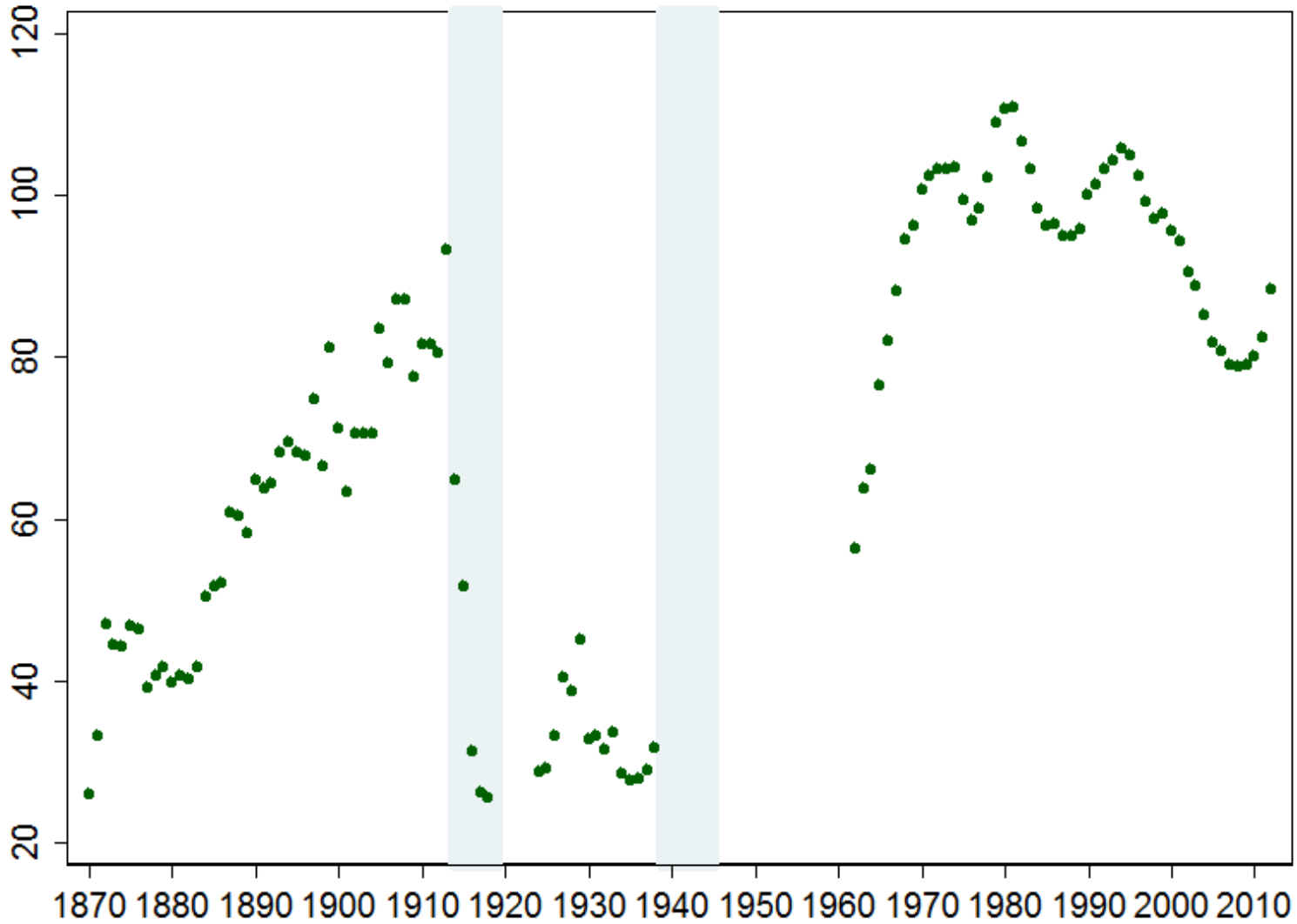
1. Freiwilliger Besitzwechsel.

a. Kauf bebauter Grundstücke.

1.	Stadttheile.	Gesammt-Zahl	Gesammt-Feuerkassen-Werth	Gesammt-kaufpreis	Durchschnittlicher Feuerkassen-Werth	Durchschnittlicher Kaufpreis
		der verkauften Grundstücke				
			Thlr.	Thlr.	Thlr.	Thlr.
1	Berlin	158	2881725	7726264	18239	48900
2	Alt-Kölln	69	1041800	2752460	15098	39891
3	Friedrichswerder	34	751225	2741850	22095	80643
4	Dorotheenstadt	112	3333875	16289800	29767	145445
5	Friedrichstadt	548	13450025	45717615	24406	83579
6	" außerhalb . .	207	6643025	16413473	32092	79292
7	Schöneberg-Tempelhofer Rev.	368	9848450	19849435	26762	53939
8	Louisenstadt	806	19353000	38138448	24011	47318
9	Neu-Kölln	22	652500	1771400	29659	80518
10	Stralauer Revier	356	8133975	15740377	22848	44214
11	Königstadt	140	2874355	5914490	20531	42246
12	Spandauer Revier	239	5489250	12032971	22967	50347
13	" " außerhalb	454	8500475	18041264	18723	39738
14	Friedrich-Wilhelmstadt . . .	52	1456925	4283236	28018	82370
15	Moabit	40	833425	1972087	20836	49302
16	Wedding	130	1182300	3532685	9095	27174
	Stadt Berlin	3735	86426330	212917855	23140	57006

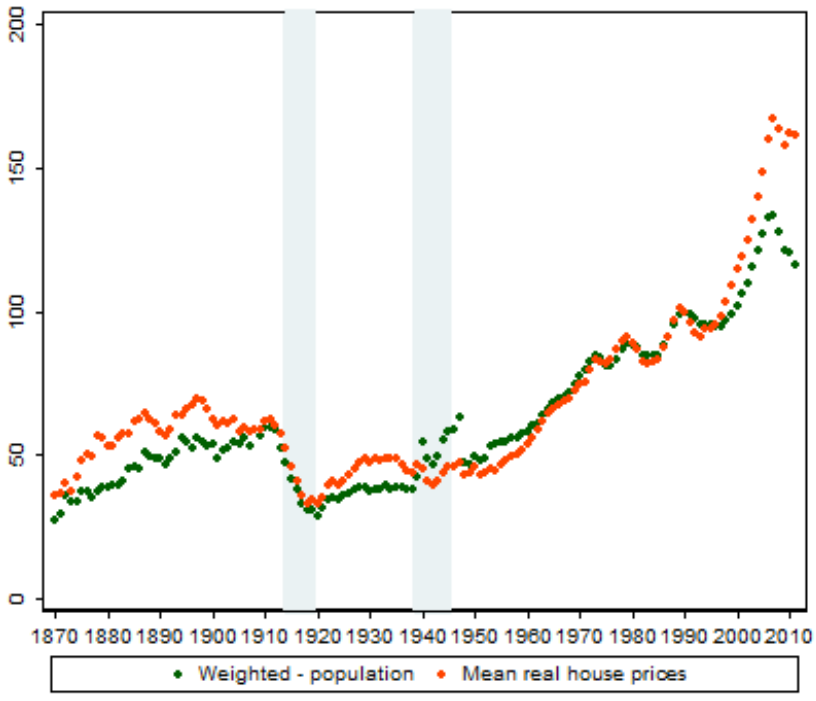
Country trends

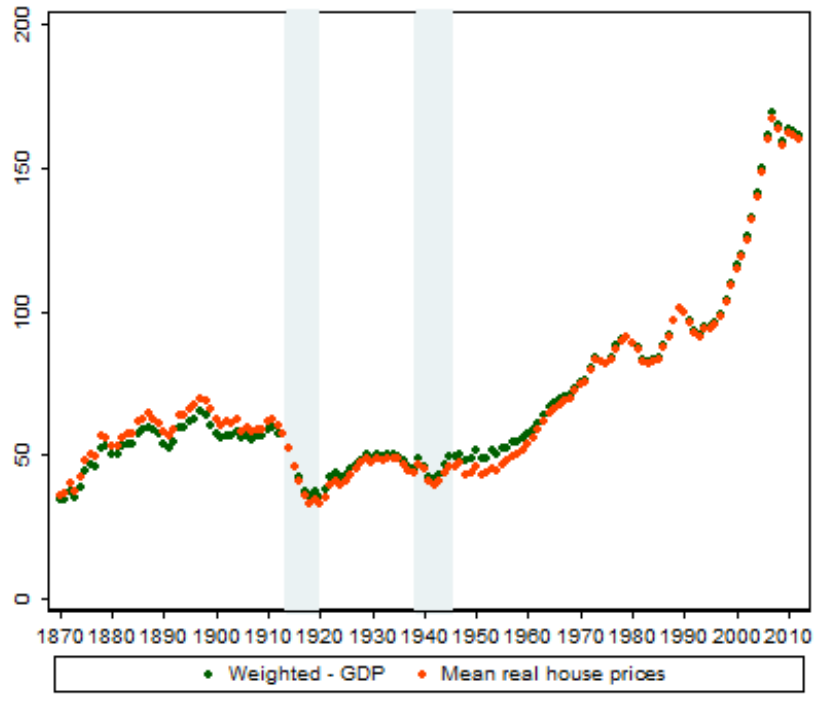
Example: Germany, 1870–2012



Robustness I

Weighting

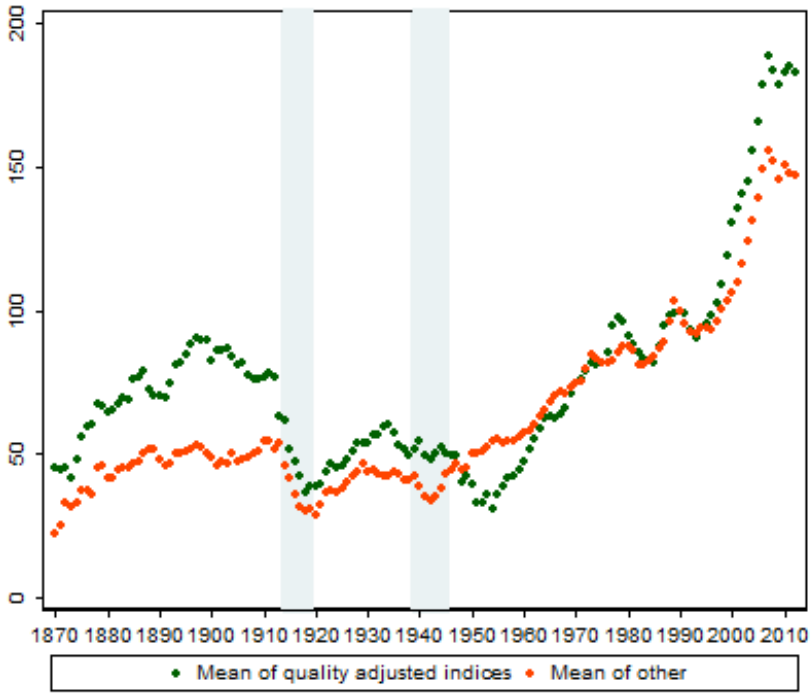




Back

Robustness II

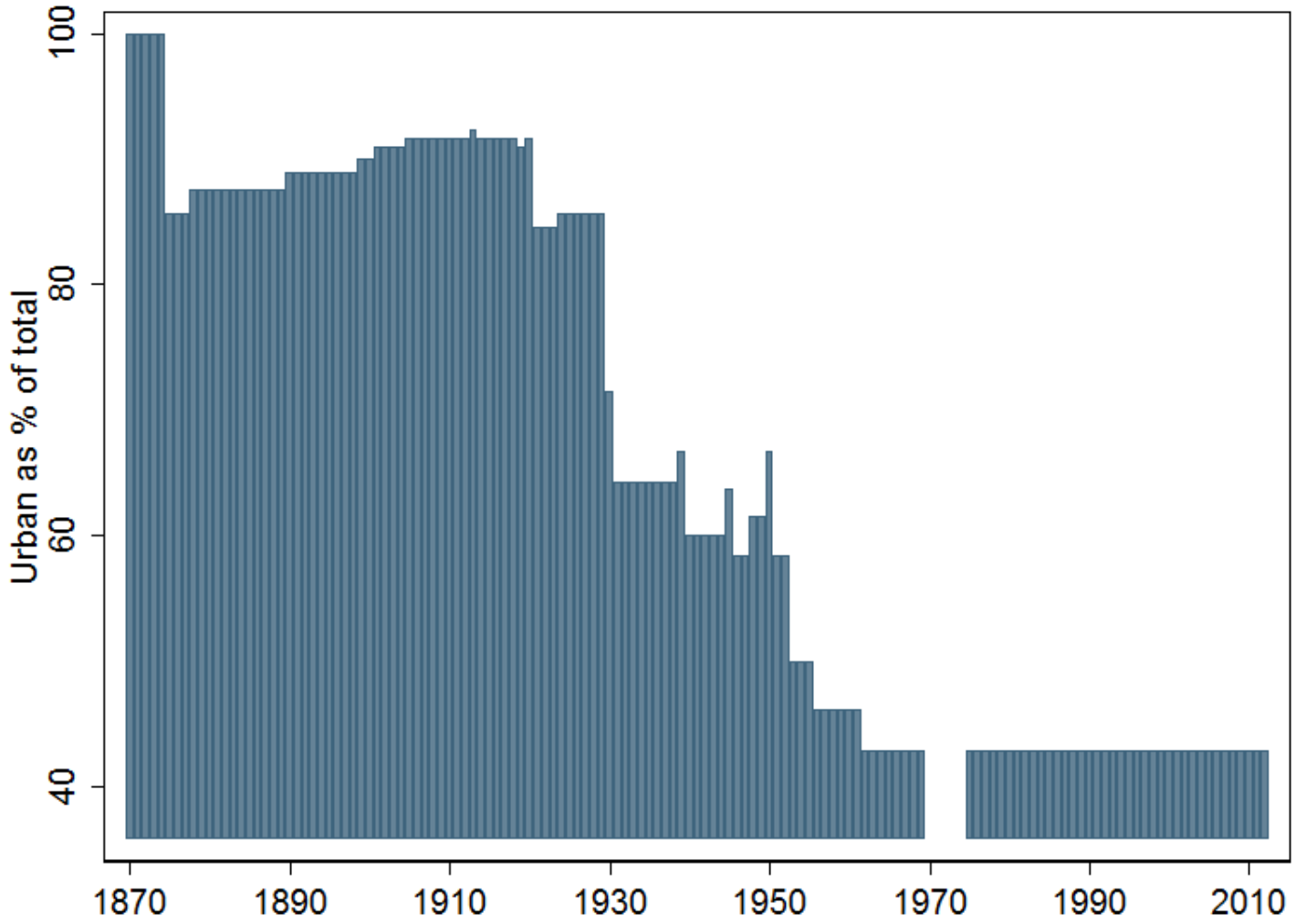
Quality adjustments



Back

Robustness III

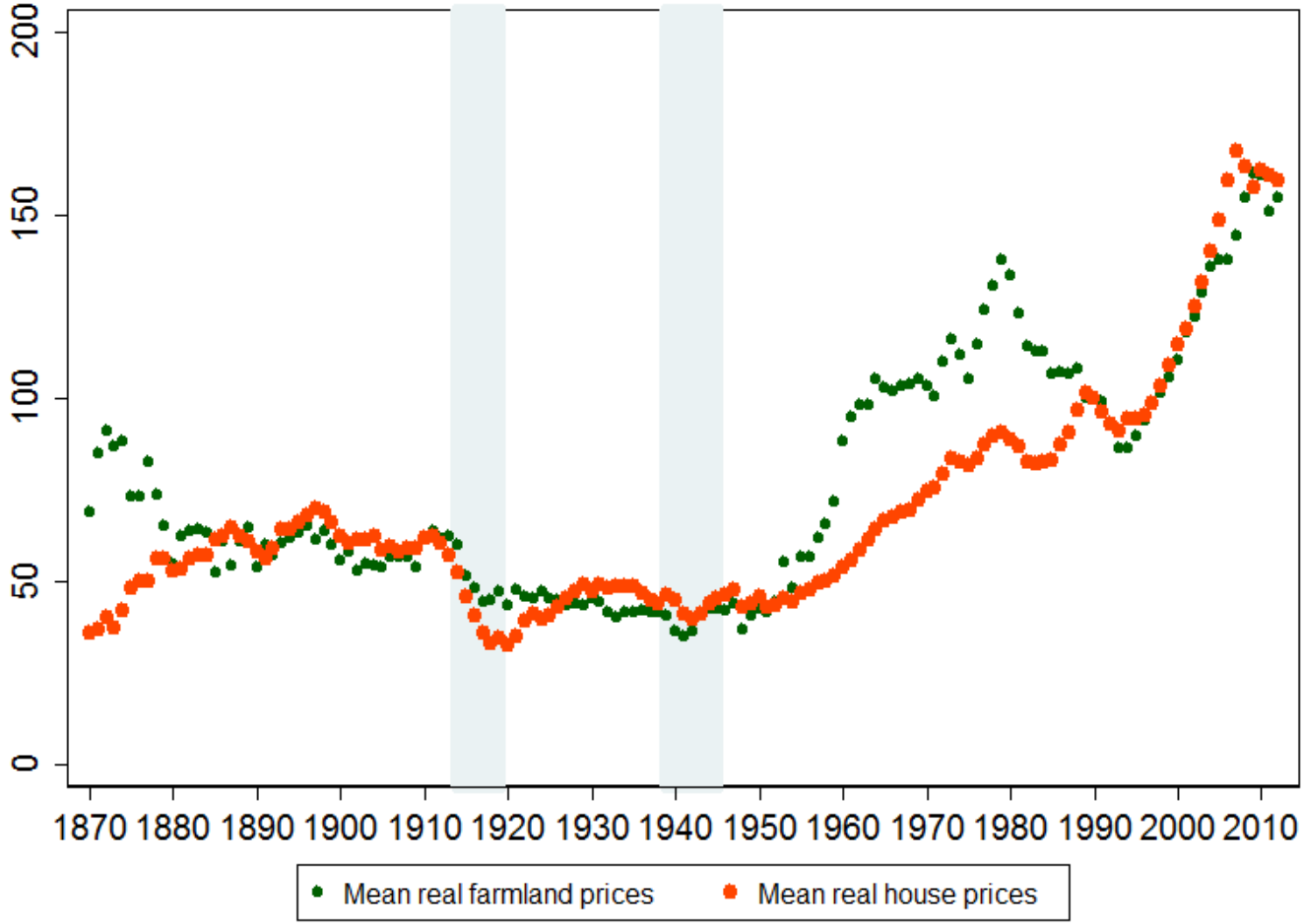
Composition



Back

Is the increase a purely urban phenomenon?

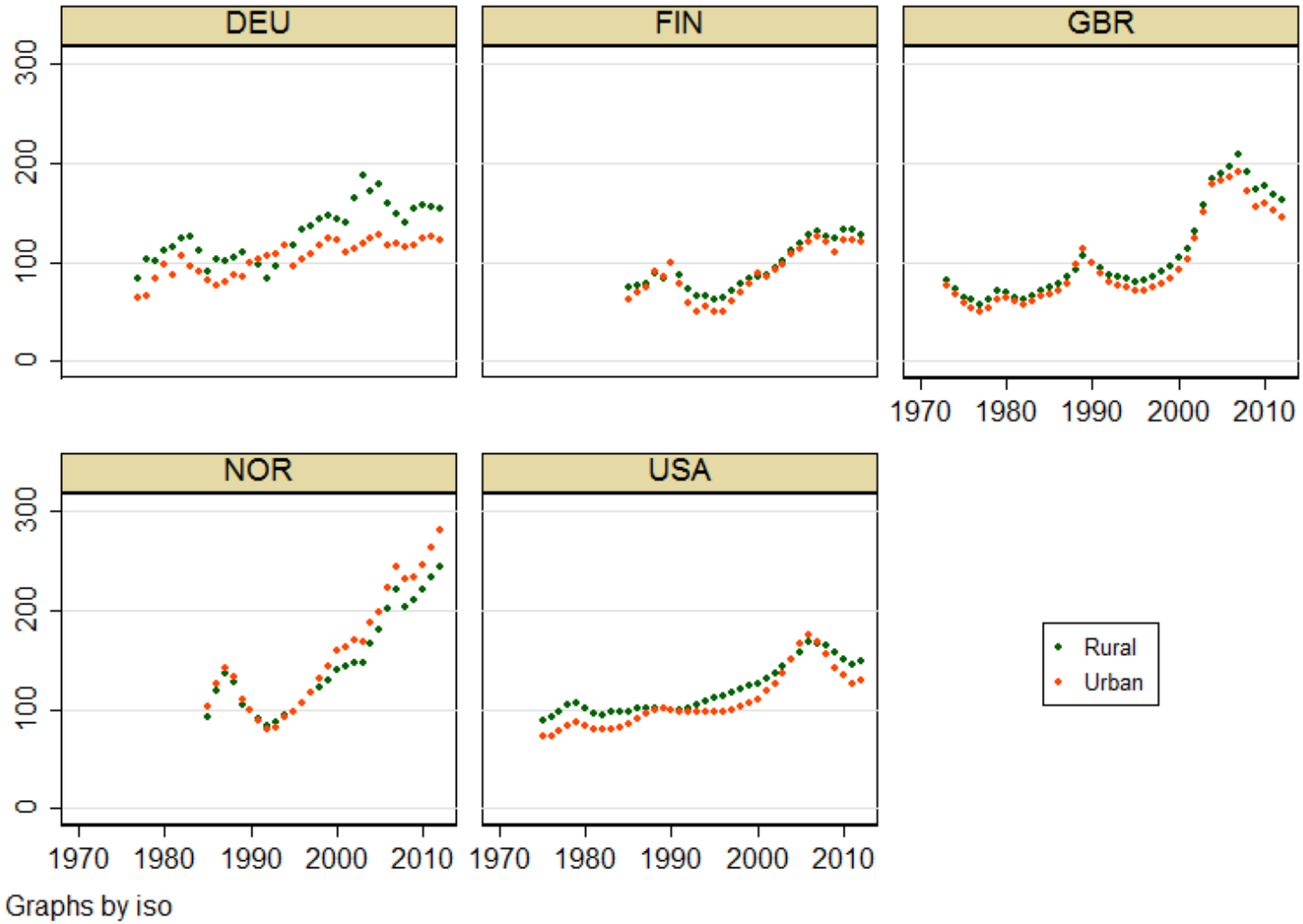
Farmland prices



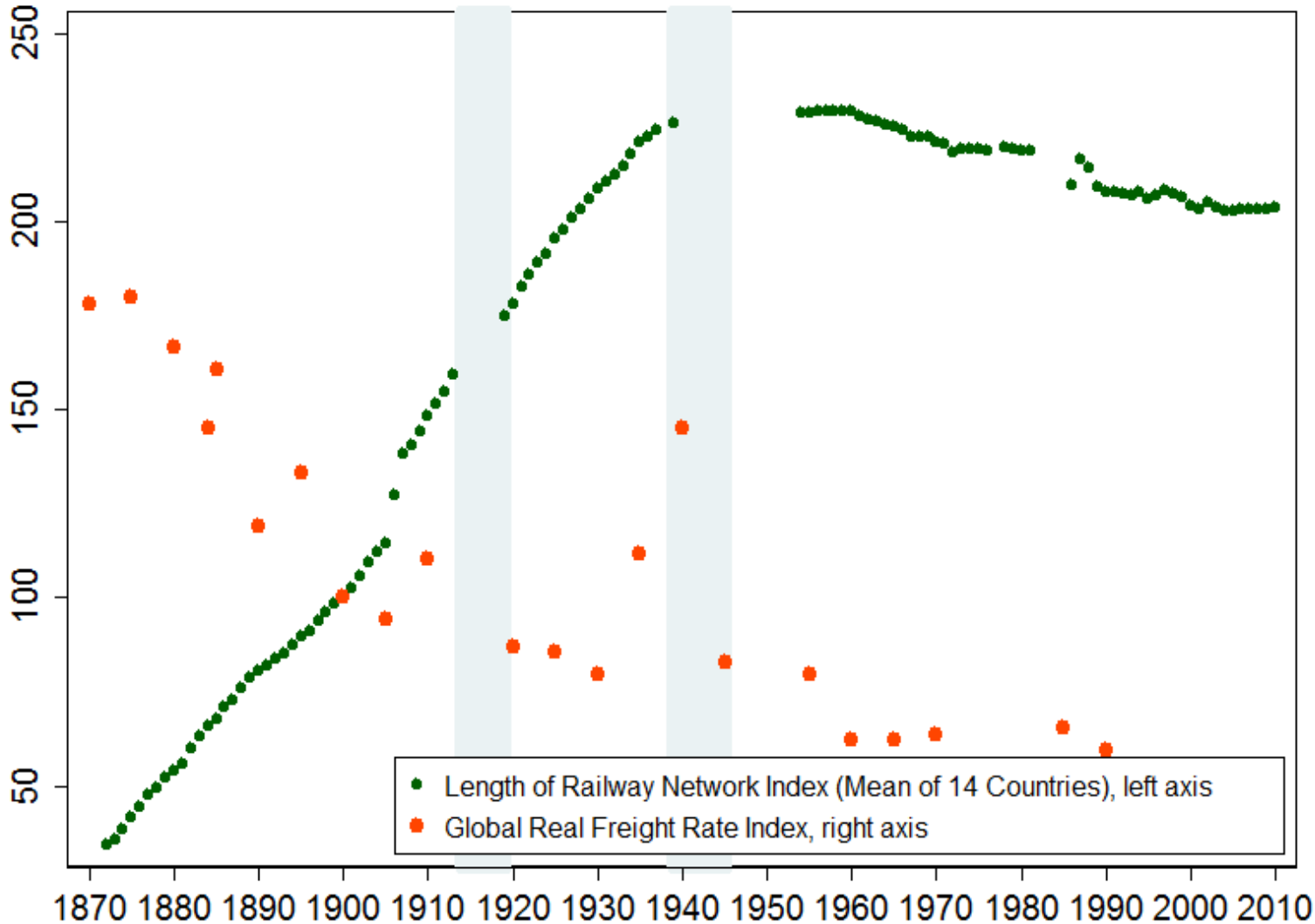
Back

Is the increase a purely urban phenomenon?

Urban and rural house prices



Transport revolution



Back

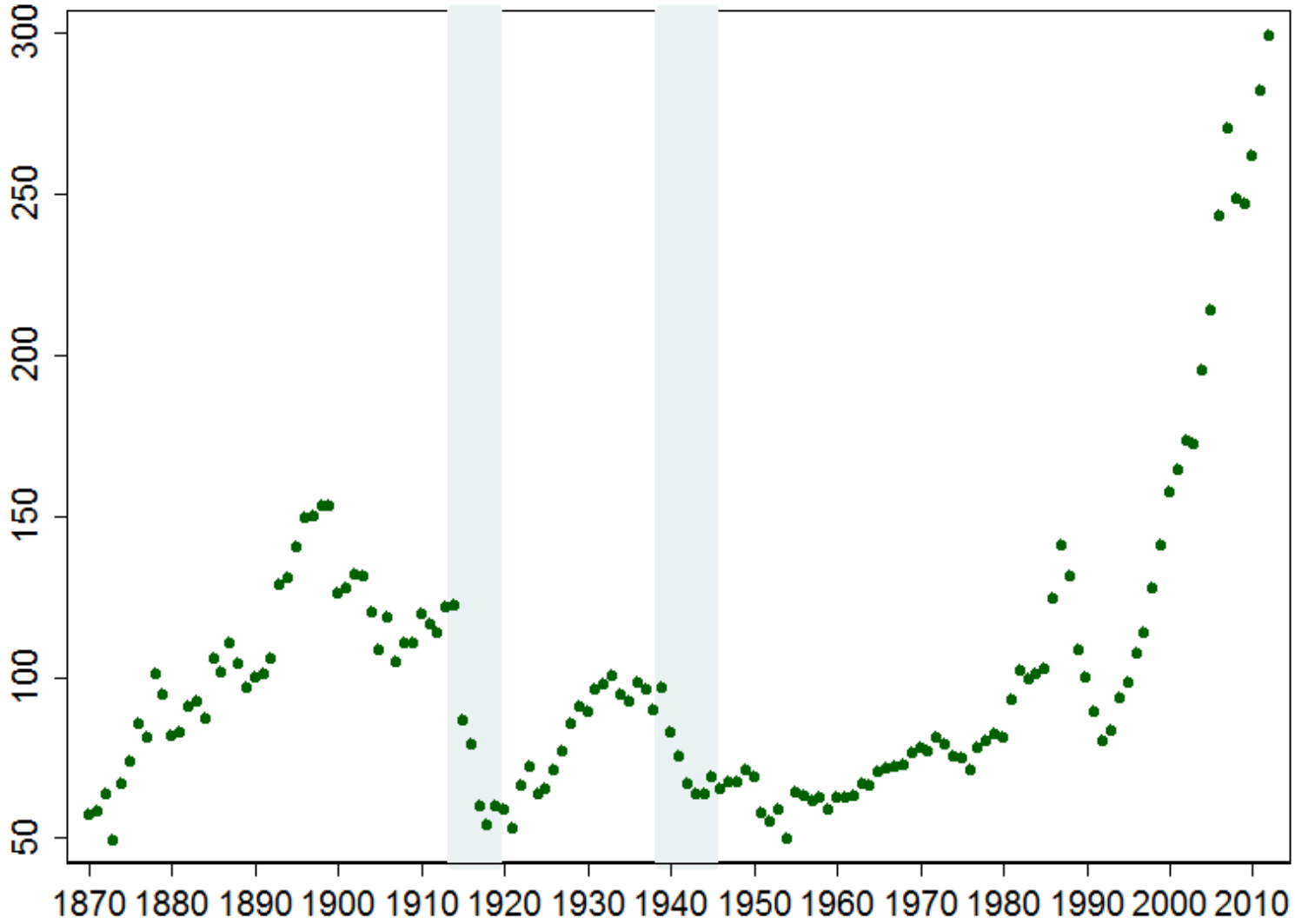
Homeownership rates in the 20th century

	CAN	GER	FRA	ITA	CHE	U.K.	U.S.	Avg.
1900							47	
1910							46	
1920						23	46	
1930							48	
1940	57					32	44	
1950	66	39	38	40	37	32	47	43
1960	66	34	41	45	34	42	62	46
1970	60	36	45	50	29	50	63	48
1980	63	39	47	59	30	58	64	51
1990	63	39	55	67	31	68	64	55
2000	66	45	56	80	35	69	67	60
2010	69	45	58	82	37	64	65	60

Back

Country trends

Example: Norway, 1870–2012



References

Carthaus, V. (1917): *Zur Geschichte und Theorie von Grundstückskrisen in deutschen Grossstädten mit besonderer Berücksichtigung von Gross-Berlin*, Jena: Gustav Fischer.

DER SPIEGEL (1961): "Baulandpreise: Nochmal davongekommen," *DER SPIEGEL*, 32–33.

Ensgraber, W. (1913): *Die Entwicklung der Bodenpreise Darmstadts in den letzten 40 Jahren*, Leipzig: A. Deichert.

Glaeser, E. L. and J. Gyourko (2003): "The Impact of Building Restrictions on Housing Affordability," *FRBNY Economic Policy Review*, 9, 21–39.

Glaeser, E. L., J. Gyourko, and R. Saks (2005): "Why Have Housing Prices Gone Up?" *American Economic Review*, 95, 329–333.

Glaeser, E. L., J. Schuetz, and B. A. Ward (2006): *Regulation and the Rise of Housing Prices in Greater Boston*, Boston, MA : Pioneer Institute for Public Policy Research; Cambridge, MA : Rappaport Institute for Greater Boston.

Holmans, A. (2005): *Historical Statistics of Housing in Britain*, Cambridge: Cambridge Center for Housing and Planning Research.

Koch, G. (1961): "Der geprellte Bausparer: Die Familienheim-Politiker bekommen kalte Füsse," *DIE ZEIT*, 28/1961.

MacLaughlin, R. B. (2012): "Land Use Regulation: Where Have We Been, Where Are We Going," *Cities*, 29, S50–S55.

Piketty, T. (2014): *Capital in the Twenty-First Century*, Cambridge: Harvard University Press.

Piketty, T. and G. Zucman (2014): "Capital Is Back: Wealth-to-Income Ratios in Rich Countries, 1700–2010," *Quarterly Journal of Economics*, 129.

Rothkegel, W. (1920): *Untersuchungen über Bodenpreise, Mietpreise und Bodenverschuldung in einem Vorort von Berlin*, Berlin: Duncker & Humblot.

Wilkinson, R. K. and E. M. Sigsworth (1977): "Trends in Property Values and Transactions and Housing Finance in Yorkshire since 1900," *Social Science Research Council Report*.